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Adversarial reasoning : computational approaches to reading the opponent?s

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Abstrak

To successfully model the adversary, not only the opponent?s capabilities but also the intent should be considered. The adversary?s intent is composed of the adversary?s desired end-states, reasons for pursuing such end-states, methods to achieve the goals, and the levels of commitment to achieving the goals. In this chapter, we present a comprehensive adversarial modeling approach that accounts for opponent intent inferencing in a dynamic and interactive environment. The model has been applied to military wargaming, resulting in an action-reaction-counteraction simulation environment where actions are initiative events (i.e., the offense from one side), reactions are the responses from the other side, and counteractions are the first side?s responses to the reactions. In such a simulation environment, the sequence of action-reaction-counteraction is continued until the critical event is completed or the commander determines to use another course of action (COA) to accomplish the mission [20]. Thus, the model helped break the barrier of prescripted adversaries in wargaming, i.e., those that act in a predetermined fashion. Furthermore, we demonstrated that models of adversaries can be readily constructed and modified in real-time during a simulation to reflect the dynamic battlefield. We begin with a discussion of intent inferencing and adversary intent inferencing, concentrating on providing a brief overview of concepts and definitions. We then present some background on representing and reasoning over noisy, incomplete, and uncertain information that is at the heart of modeling intent prediction, explanation, and understanding. Next, we describe our adversary intent inferencing framework, the semantics for building adversary models, and the inferencing process. With the framework in place, we describe its application to conflict analysis and wargaming. In particular, we provide details on some of the testbeds used in our experiments for inferring adversary intent. Finally, we present our thoughts and conclusions. 1.1.1 Intent Inferencing In Bratman?s belief-desire-intention (BDI) model [5,6], the intentions are viewed as partial plans committed by an intelligent entity to achieve certain goals (desires) based on the perception or knowledge of the world (beliefs). The intentions in the BDI model are also understood as a subset of desires upon which an entity chooses to act. In Geddes? view [11], intent inferencing involves deducing an entity?s goals (desired end-states) based on observations of its actions. Such deduction typically involves the construction of one or more behavioral models that are optimized to represent the entity?s behavior patterns. After data and knowledge representing observations of an entity, its actions, and its environment (collectively called observables) are